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# Carrying Capacity of Ranges in Western United States

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Few persons realize the importance, necessity and far reaching results of proper range management. There was a time on the Western ranges when 2 or 3 acres of grass land would support a cow or horse. At the present time, 20 to 30 acres per head are needed on the same area. Had the stockman of those days applied some of the principles his neighboring farmers were applying, perhaps unknowingly, he would have maintained the productivity of the range and would have benefited the present generation in lower beef prices. However, let it be said in defense of the cattleman of that day, he was only human. Perhaps anyone seeing the wonderful and abundant forage which covered the West, would have been prompted with the same "get-rich-quick" motives and have exploited the range to its capacity and over and then left the future to care for itself. Years after the ranges were overstocked, state legislatures passed various laws concerning the grazing of stock on public ranges and finally, with the creation of National Forests, many ranges came under the more rational systems now being used by the Forest Service. In a way, it is safe to say that the methods of handling stock are still in their infancy and are still extensive although some of them are called "intensive."

Carrying capacity may be roughly defined as being the number of stock that a range can carry without any depreciation in amount of forage. Indeed, at the present time it goes farther. The aim not only is not to have any depreciation in amount of forage but to try to increase the amount up to the point where it rightfully belongs. To do this there are several factors which enter into the discussion. They are:

Accessibility or nearness to water.
Topography.
Length of time range can be grazed.
Character of vegetation.
Economic conditions nearby.
Diseases and natural foes.

Regardless of how abundant the forage is or how palatable, it has no value unless there is water within reasonable distance. This distance varies in different regions and is affected by the humidity of the air to a very large extent. In Oregon cattle will not travel very readily over about 3 miles to water. In

southern Arizona cattle have been known to travel over 13 miles to water and this every 36 hours in a climate that is exceedingly torrid. It is quite possible to have water so located that all parts of a range will be equally fed, but this is very seldom the case. Usually the intensity of grazing decreases with increase of distance from water. Water is as essential as feed itself. Very often stock will eat plants near water that they will not touch at a greater distance from water. For instance, sheep will eat hellebore near watering places and bedding grounds, but they would not touch it at some distance or where other forage is present. In connection with the discussion concerning water it might be well to state that more and more the importance of good, pure water is coming to be realized. Many stockmen even warm the water in the winter. The older stockmen seemed to think that as long as mud and muck was thin enough to drink it was good enough for any kind of stock.

A level plain would represent an ideal grazing ground to the novice, but here again there is room for argument. A level plain, provided that the yearly temperatures were agreeable and that enough forage and area were available to rotate the different parts, would approach the ideal, but a plain with nearby high mountains forms the best range. On the Wallowa National Forest in Oregon differences in elevation ranged from 900 feet to almost 10,000 feet with corresponding vegetation. This really forms an ideal system, for stock can graze the low elevations in winter and gradually move up towards higher elevations as the snow melts and then return when the first snow falls in the autumn. Of course, there are some drawbacks to this system, but they cannot be enumerated here. However, the point that should be emphasized in this paragraph is this—regardless of whether there is feed and water, the range cannot be used if it is not accessible. Take a case of a mountain side covered with the best of grasses and with abundant water, but beset with steep cliffs and slides for a part of its area so that stock could not safely use it. Until trails and driveways are built, it would be largely a waste range. Very often there are ranges that would make good forage for one class of animals while another would starve. This would be true of goat ranges; sheep or horses or even cattle would starve to death on some goat ranges. This then would be considered an inaccessible forage, if there were no goats to feed it. To get the full forage value and carrying capacity out of a piece of range, then, one must consider its accessibility.

In the warmer parts of this country there are yearlong ranges. That is, grasses and weeds are accessible to stock in winter as well as in summer. This, then, makes the harvesting of crops to feed in the winter unnecessary as is the case when snow

covers the ground for a large part of the winter. It does bring in a similar condition and that is, having some forage to be consumed during the winter. This can be done by fencing off an area or cutting down the number of animals so that enough forage will be on hand to carry them through the winter. If this is not done a condition will prevail which exists in this particular section at present. No reserve food supply was or ever is left and when a dry, cold winter comes and is followed by a late spring, cattle losses are heavy. To overcome such a system, a series of pastures can be put in and "rotated" like the Iowa and Illinois farmer rotates his fields and crops. In the case of the Wallowa National Forest, there were 4 classes of ranges, although only 2 were recognized—winter and summer. To these could be added spring and fall. In a case of this kind the summer range period would last not over 2 months, while the spring and fall periods would probably be the longest, depending on the season. One year in eastern Oregon the season consisted of 2 months spring and 10 months winter.

Character of vegetation determines the kind of stock that can best use the range. For instance, sheep will eat hackberry and thrive on it. Horses and cattle will barely eat it unless forced to. Therefore, it would be a waste of forage to try to make cattle and horses feed on hackberry range when sheep will eat it readily. The same holds true of coarser grasses. Sheep are careful about what they eat. They prefer tender shoots and flowers. They eat grasses but do not care for coarser ones, especially when they are dried or "cured." Now, cattle and horses are fond of grasses and eat cured grass as readily as green. Under proper conditions they do better on dried grass than on green. Therefore, if there is a range that is at its best in the fall and is composed of coarse grasses, it should be fed to cattle and horses —while green and tender it can be lightly grazed by sheep. When possible, the range should be so arranged that the right class of stock uses the range best suited to that class of animals.

Under economic conditions nearby, there should be considered the activities that persons living near any particular piece of range are engaged in. For instance, several large farmers living next a piece of range, have each several head of cattle and horses. The range might be better sheep range, but these men do not have enough stock to warrant moving them on to regular cattle range, so they are put on the wrong class of range adjoining their ranches. Very often this makes necessary a large waste of forage, for it takes more acres of sheep range to run a cow than it does to run a corresponding number of sheep. Also a small sheep man living in a cattle country wants his sheep to range near his ranch, so he runs his sheep in the cattle range. As he gets more sheep and can keep a herder, he may very likely move his stock to a sheep range.

Most stock are susceptible to some disease or other and steps must be taken to prevent their occurrence and spread. In connection with cattle some excellent preventatives have been used. For blackleg many stockmen are now using vaccine and their losses have been cut down noticeably. The very best of ranges are not immune from some diseases and in order to obtain the maximum carrying capacity, measures must be taken to prevent their spread. Very often these diseases are communicated to man as, for example, the "Mountain fever," which is so fatal to man and which is transmitted by ticks. Among natural foes are coyotes, wolves and lions. In one region it was impossible to raise colts for 13 years because mountain lions were so abundant. In the southwest wolves bother stockmen appreciably despite the efforts of the Biological Survey to eradicate them. Coyotes create considerable havoc with sheep and goats, often killing them merely for the pleasure they derive from it and not through necessity. It will be easily understood how a range on which predatory animals are abundant will affect the carrying capacity. Under this heading we may also include poisonous plants. Many are doubtless aware that the Forest Service posts conspicuous warnings in badly infested areas. On one range alone 40 head of cows were counted that had died of poisoning, and the end was not yet in sight. This condition was affecting the carrying capacity by making it necessary to remove the stock to other areas. If nothing is done, it will be necessary to consider the area as waste, inaccessible or undesirable range, or put on some class of stock that is immune to this particular plant.

After having taken the foregoing points into consideration, the amount of forage present must be known and from this can be determined how many animals the area will carry. This is rather a cut and try affair. In a short while the maximum carrying capacity for a range can be determined. When stock are properly watered, salted and distributed, it is possible to increase the carrying capacity from 10 to 100 per cent. Ten per cent may seem a small figure. However, when it is considered that in 1914 there were 1,508,639 cattle on forest ranges and add 10 per cent, giving an increase of 150,863, which at $30.00 per head for yearling yields a monetary increase of over $4,500,000, it is an item worth while. In some cases a 10 per cent increase may mean only a cow or 2 on an allotment, nevertheless, they all represent dollars and cents.

At the present time the Forest Service has experiments started in which problems in carrying capacity and range management are being studied in detail. Range reconnaissance is nothing more than a step toward increased capacity and more efficient range management. It would be impossible for one, in the short space allotted, to go into the very large number of points which come up in a grazing reconnaissance or in the making of a graz-

ing working plan. On the Santa Rita Range Reserve the plans cover about 20 typewritten pages and there are only about 32,000 acres to deal with. The plan here is essentially one in which the forage is allowed to mature its seed before stock are permitted to graze it. In this way the continuance of the present stand of forage is assured and the natural reseeding is provided for by allowing plants to go to seed.

In conclusion, the writer feels safe in saying that the next 10 years will see a great change take place in the method of handling stock on public ranges. This change will originate with the Forest Service and in time will be voluntarily taken up on private holdings.